samples which are important parameters to gain knowledge about the technological level of the Japanese weaponsmiths. A comparison with the typical characteristics of Japanese swords and helmets is also presented, showing that the quality of the metal composing the arrows is intermediate between the one used for swords (very high quality) and the one used for armour pieces (low quality).

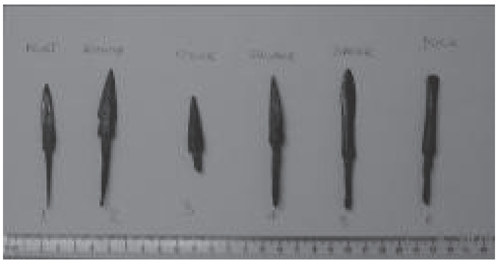

Fig.1 Picture of the six arrows measured through neutron diffraction.

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Keywords: japanese arrows, neutron diffraction, quantitative analysis.

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Importance of X-Ray Analyses in Slag Studies at Clintonville, New York, USA

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X-ray diffraction and x-ray fluorescence analyses of historical iron slags from Clintonville, NY, USA help describe the slags and provide insight to the uniformity and efficiency of the techniques used at the Clintonville Forge in the 1840s. Over 70 samples of slag, byproducts of the smelting process, were collected then divided based on macroscopic morphological characteristics. Samples were then analyzed with powder x-ray diffraction (XRD) in order to identify the mineral constituents within the slag. The wide range of morphologies does not govern mineralogical assemblages in Clintonville samples, as originally hypothesized. Modal abundances do, however, vary for some morphological groups. Clintonville slag commonly contains fayalite and magnetite, with minor occurrences of wüstite, forsterite, and glass. Although these phases are common in iron slag, the XRD is quintessential for definitive identification. This is especially important when these phases make up the fine-grained ground mass. Analyses using x-ray fluorescence spectroscopy (XRF) indicate chemical homogeneity for major oxides and trace elements throughout the morphological groups of slag. Consistent mineralogies and chemistries amongst slags reflect uniformity in the smelting processes at the forge. X-ray data further indicate that the Clintonville process was not efficient. Pure iron prills are nearly ubiquitous in the slags. Ore and cinders from this site have a total iron oxide content (FeO_t) ranging from 80-88 weight percent. Clintonville slag samples contained between 56 and 68 weight percent FeO_t. The smelting processes utilized at Clintonville consolidated only 12-20% of the iron into the final product.

Keywords: slag, fayalite, archaeometry

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The fluorescence life time of ruby at high pressures and temperatures

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The pressure determination in diamond anvil cell (DAC) experiments at high pressure and temperature (high-p,T) based on the ruby fluorescence method [1] is not straightforward, as both, pressure and temperature, have a significant influence on the frequency of the ruby fluorescence [2]. Here we sugest an alterative approach based on fluorescence life time measurements.

Fluorescence life time (FLT) thermometry is an established method at ambient pressure, where the ruby FLT decreases by three orders of magnitude between 300 and 900 K [3]. Up to now, only few reports concerning the pressure dependence of the FLT have been published. At 295 K the ruby FLT linearly increases between ambient pressure and 40 GPa by one order of magnitude [4].

Here we present the first study of the FLT of ruby at high-p,T. The FLT was measured in an externally and laser heated DAC. The fluorescence was excited by a ns pulse of a Nd:YAG laser at 532 nm. At constant temperatures the FLT increases linearly with pressure in the pressure range studied (< 30 GPa). At constant pressure the FLT decreases linearly with temperature. Our experiments show that FTL measurements may provide a reliable method for the determination of temperatures in a DAC at high pressure. A significant advantage will be, that FLT measurements on doped samples will unambiguously give bulk temperatures.

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Keywords: thermometry, fluorescence life time, diamond anvil cell

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Energy-domain SR ^{57}Fe-Mössbauer spectrometer for high-pressure mineral physics

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Iron is the most abundant element in the Earth. The multiple electronic configurations of iron (valence and spin state) give rise to complex physical and chemical properties of the Earth's mantle, resulting in the influence on the structure, dynamics, and evolution of the Earth's interior. The spin-state crossover and the valence state in $(Mg,Fe)(Si,Al)O_3$ silicate perovskite and post-perovskite, the most abundant mineral (~75 wt.%) in the lower mantle and the lowermost mantle, respectively, are essential for modeling the Earth's lower mantle. The degree to which the spin and valence states of iron in the